

**Amendments to the Claims**

This listing of claims will replace all prior versions, and listings, of claims in the application:

**Listing of Claims:**

1-48 (Cancel)

49. (Currently amended) A method for detecting atherosclerosis suitable for in vivo evaluations comprising:

administering a first bolus of hyperpolarized  $^{129}\text{Xe}$  gas in vivo to a patient so that said hyperpolarized  $^{129}\text{Xe}$  travels to a region of interest;

applying a first at least one excitation pulse to said first administered hyperpolarized  $^{129}\text{Xe}$  in the region of interest;

acquiring at least one first response signal spectrum prerepresenting a response of said hyperpolarized  $^{129}\text{Xe}$  to said at least one pulse via nuclear magnetic resonance spectroscopy;

identifying at least one spectral region of interest in said first response signal spectrum;

analyzing said at least one spectral region of interest in said first response signal spectrum;

determining the presence of atherosclerotic plaques on the basis of the presence or absence of at least one spectral peak and/or at least one selected feature of at least one spectral peak in the response signal spectrum based on said analyzing and identifying steps;

providing a therapeutic agent to the patient to treat the atherosclerotic condition;  
then

administering a second bolus of hyperpolarized  $^{129}\text{Xe}$  gas in vivo to a patient so that said hyperpolarized  $^{129}\text{Xe}$  travels to a region of interest;

applying a second at least one excitation pulse to said second administered hyperpolarized  $^{129}\text{Xe}$  in the region of interest;

acquiring at least one second response signal spectrum representing the response of said hyperpolarized  $^{129}\text{Xe}$  to said at least one pulse sequence via nuclear magnetic resonance spectroscopy;

identifying at least one spectral region of interest in said second response signal spectrum;

analyzing said at least one spectral region of interest in said second response signal; and

evaluating the treatment efficacy of the therapeutic agent based on the first and second analyzing steps.

50. (Previously presented) A method according to Claim 49, wherein said evaluating step comprises comparing selected spectral characteristics in the first and second response signal spectrums.

51. (Previously presented) A method according to Claim 49, wherein said second analyzing step further comprises identifying whether the atherosclerotic condition has deteriorated or progressed from the time of the first analyzing step.

52. (Previously presented) A method according to Claim 49, further comprising evaluating at least one of the acquired first and second response signal spectrums to identify whether the atherosclerosis is likely to correspond to an early stage with soft, fatty deposits, an intermediate stage with moderate calcification, or a late stage with hard mineralized or calcified deposits and/or lesions.

53. (Previously presented) A method for detecting atherosclerosis according to claim 49, wherein the region of interest comprises at least one of the carotid arteries.

54. (Previously presented) A method for detecting atherosclerosis according to Claim 53, wherein said at least one excitation pulse for the first and second applying steps comprises a resonant RF pulse sequence selected to produce large flip angles in said hyperpolarized  $^{129}\text{Xe}$ .

55. (Previously presented) A method according to Claim 49, wherein the first applying, acquiring and analyzing steps are carried out to define a baseline physiological profile of the patient.

56. (Previously presented) A method according to Claim 49, wherein at least said first analyzing step comprises assessing whether the width of a curve associated with a peak in the response spectrum is narrower than a corresponding peak in a reference spectrum corresponding to an epidemiological study and/or an a priori baseline spectrum to determine whether the patient has atherosclerosis.